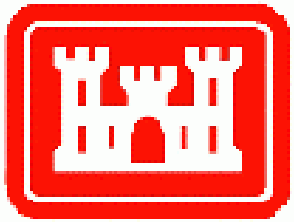

The Conceptual Modeling Approach in the Surface-water Modeling System

Grid independent representation

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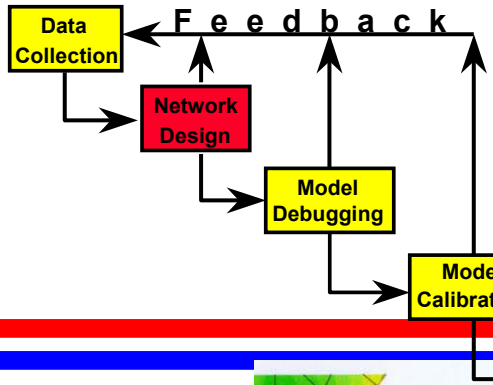
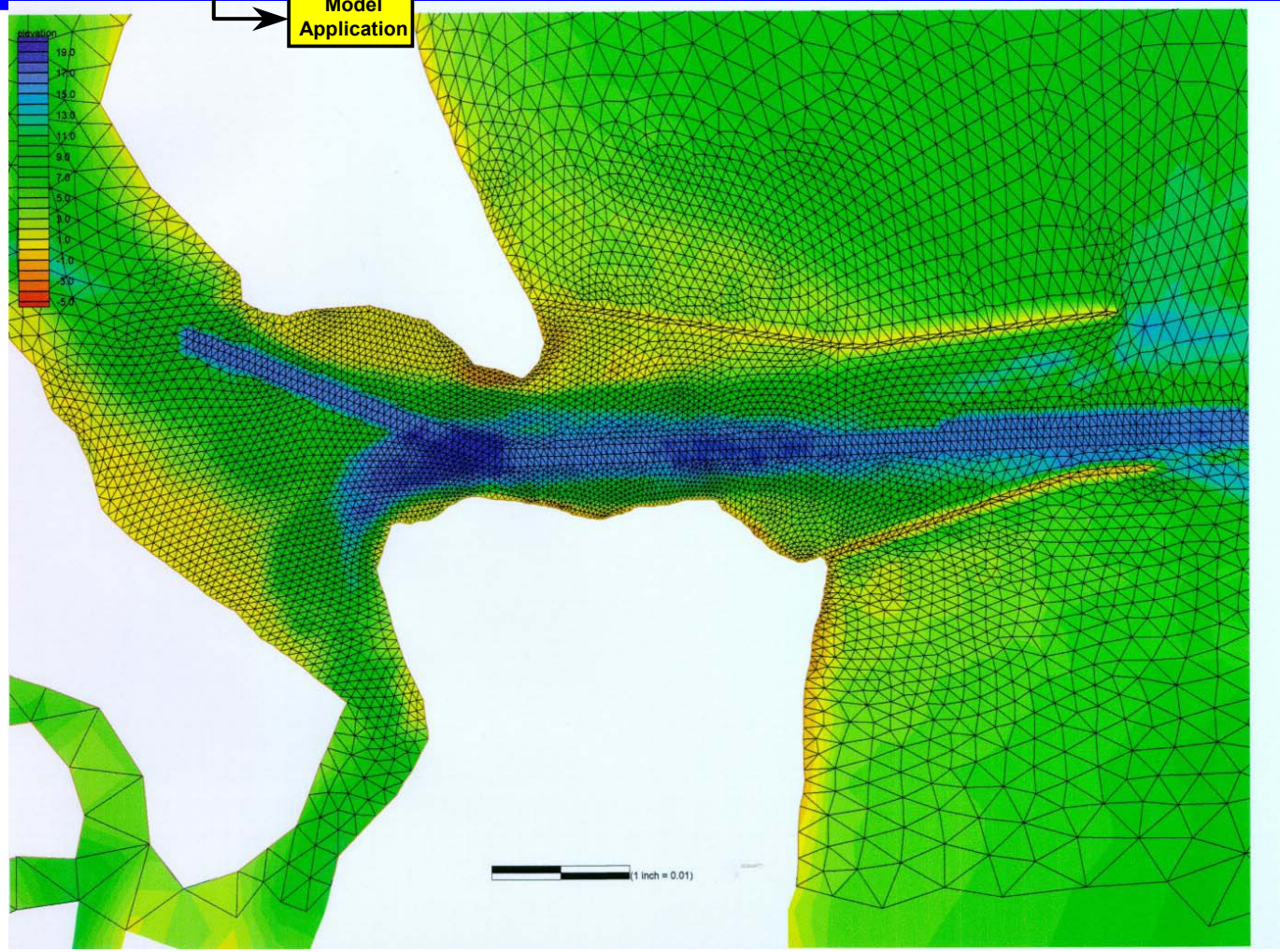
What is a Conceptual Model?

- Grid independent representation of the conditions to be modeled
  - Extent of region to be modeled
  - Attributes of features in the area
- Basis of automatic grid generation

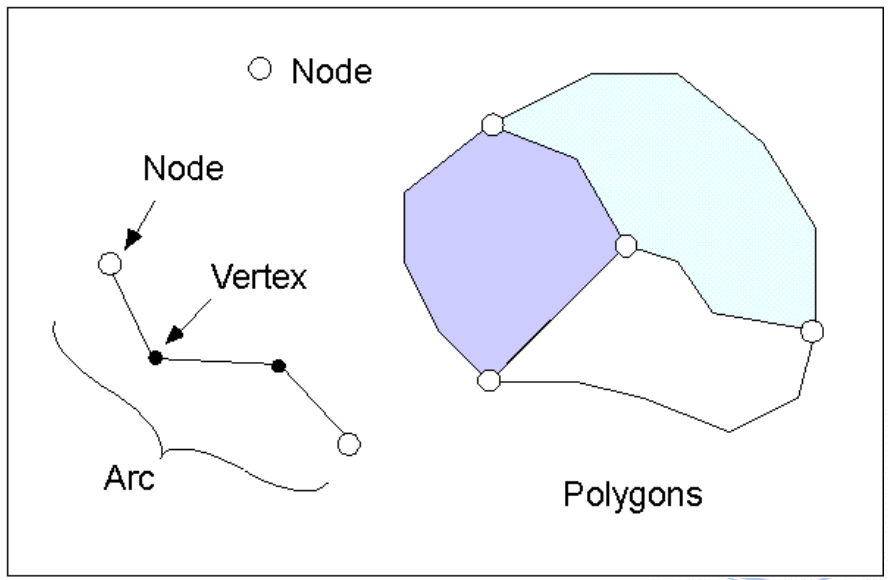


Automatic Grid Generation



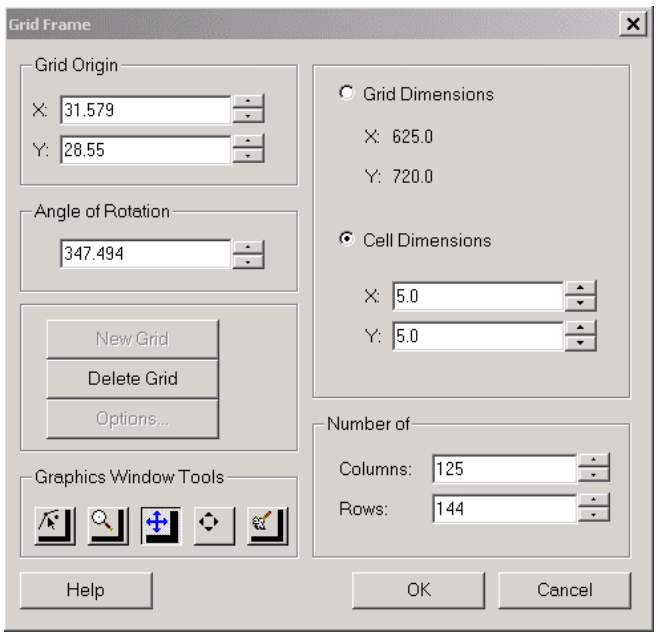
Conceptual Modeling

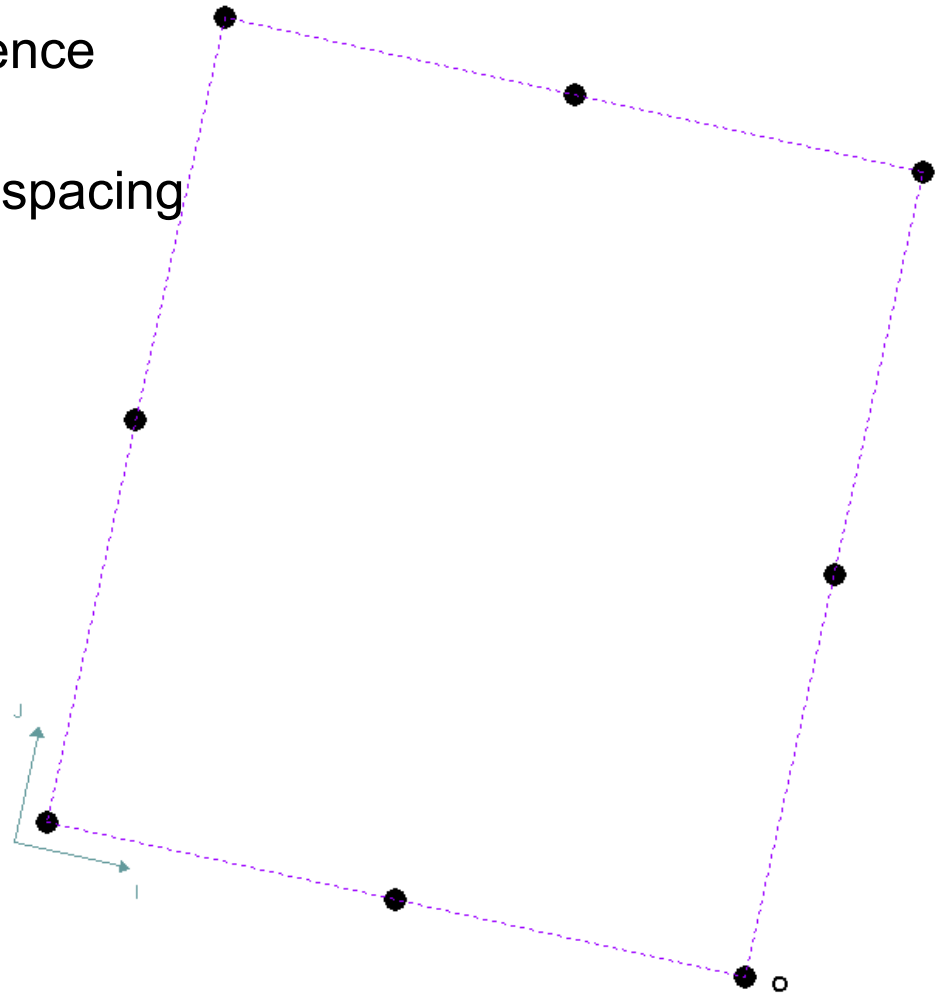
- GIS Objects Define the Model Domain
- Nodes are Connected to Create Arcs
- Arcs are Connected to Create Polygons
- Important Features are Located
- “Feature Objects”



Grid Frames

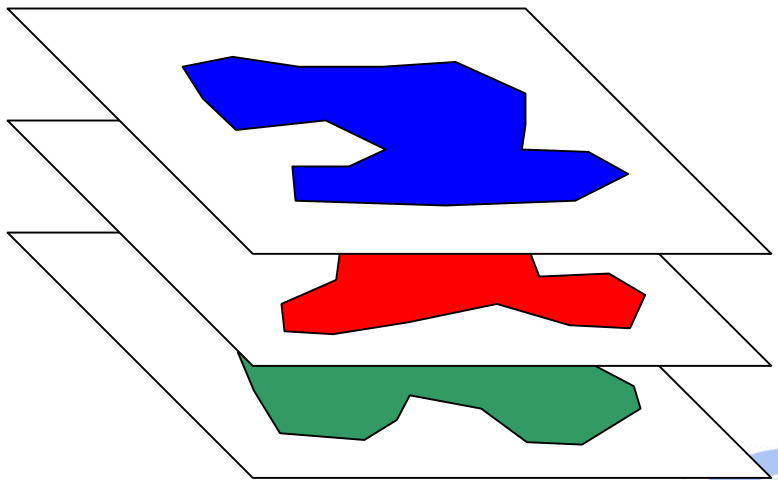
- Used for creation of Finite Difference Grids
- Feature Points used to alter grid spacing
  - Supported in M2D





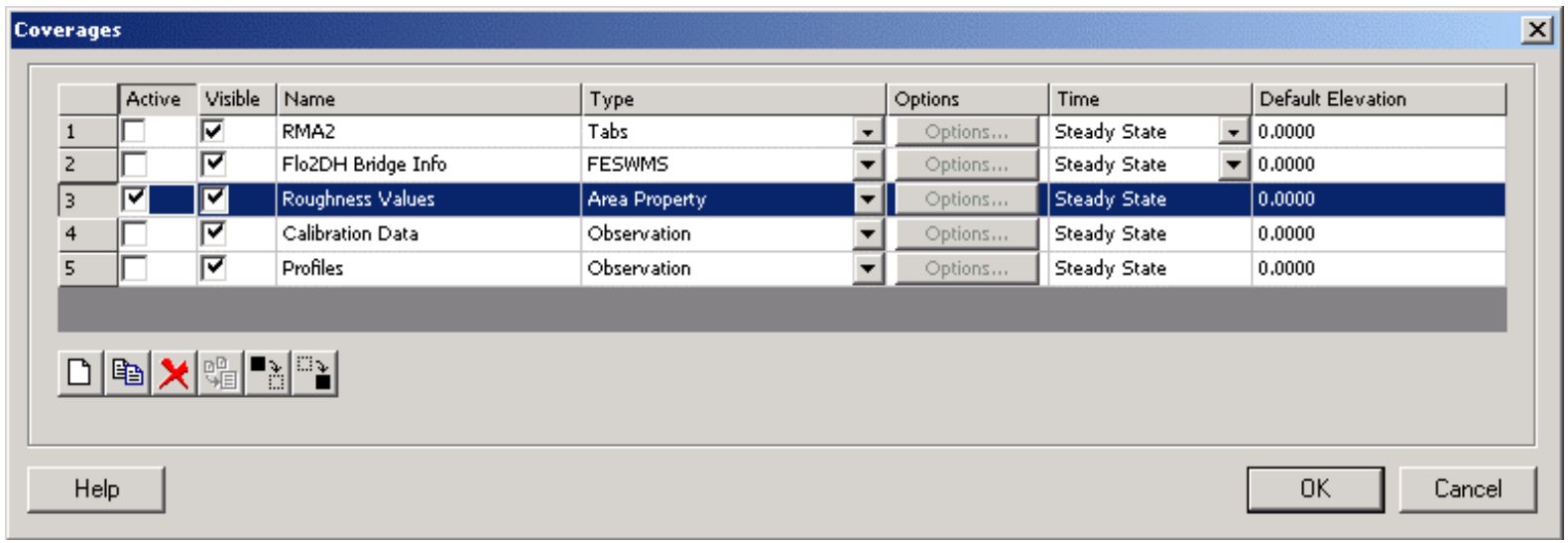
Coverages

- GIS Layers
- Each coverage contains points, lines, and polygons

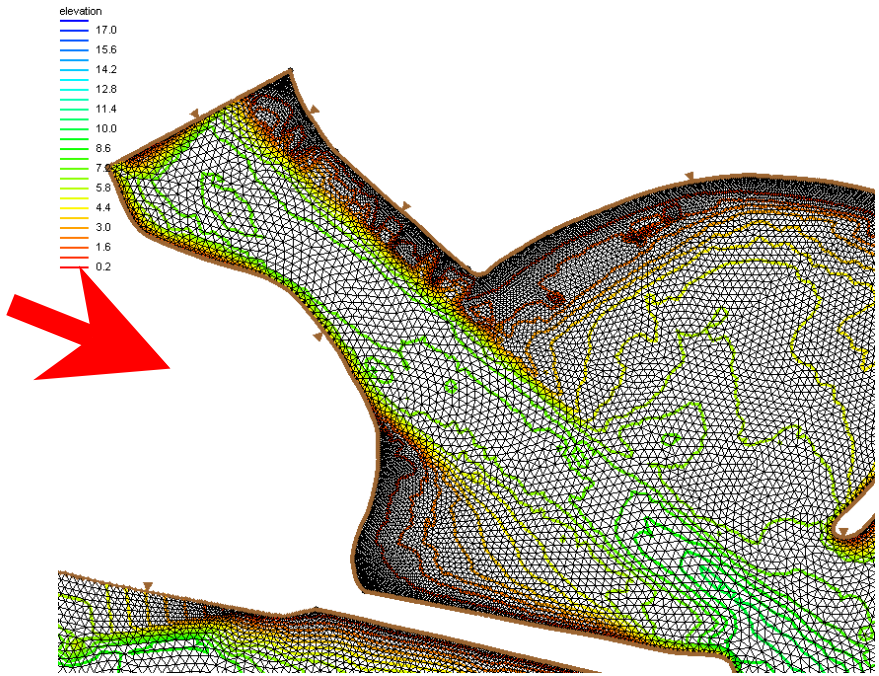


Coverages

- Feature Objects are Divided into Coverages (Like Layers)
- Coverage Type Determines how Feature Objects are Used
- Coverages for Each Numerical Model
  - (ADCIRC, STWAVE, M2D, CGWAVE)

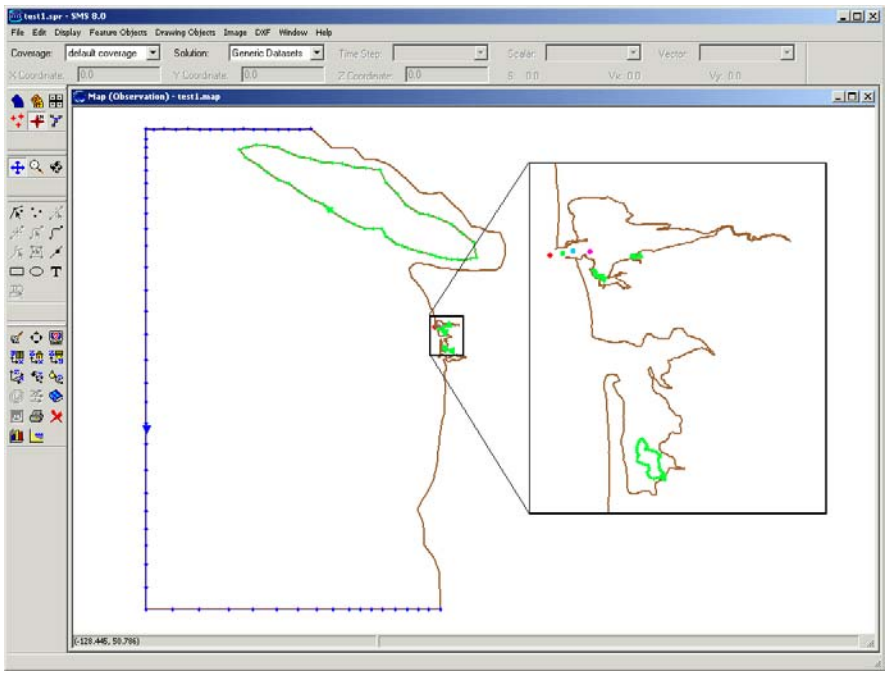


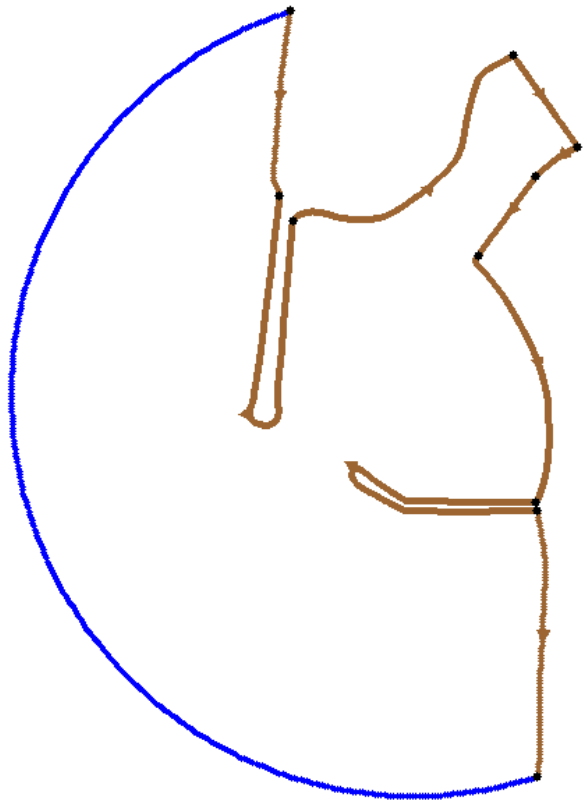
Using a Conceptual Model for Network Development



Geometry-Solution Domain

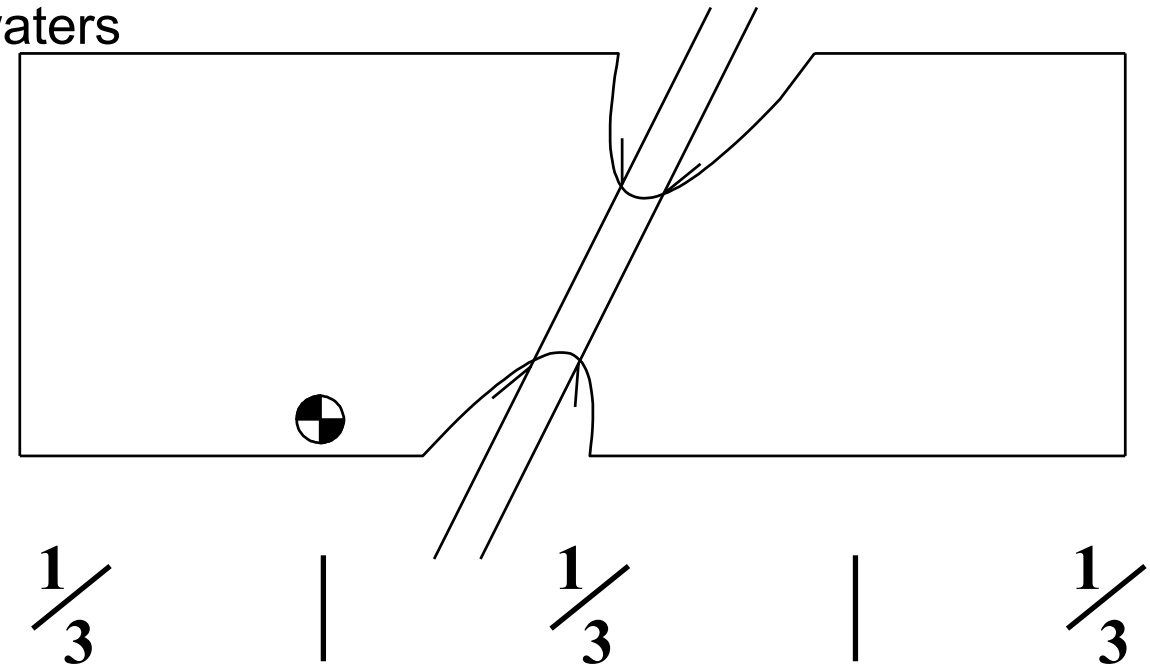
- Define Model Area
- Higher Detail in Areas of Interest



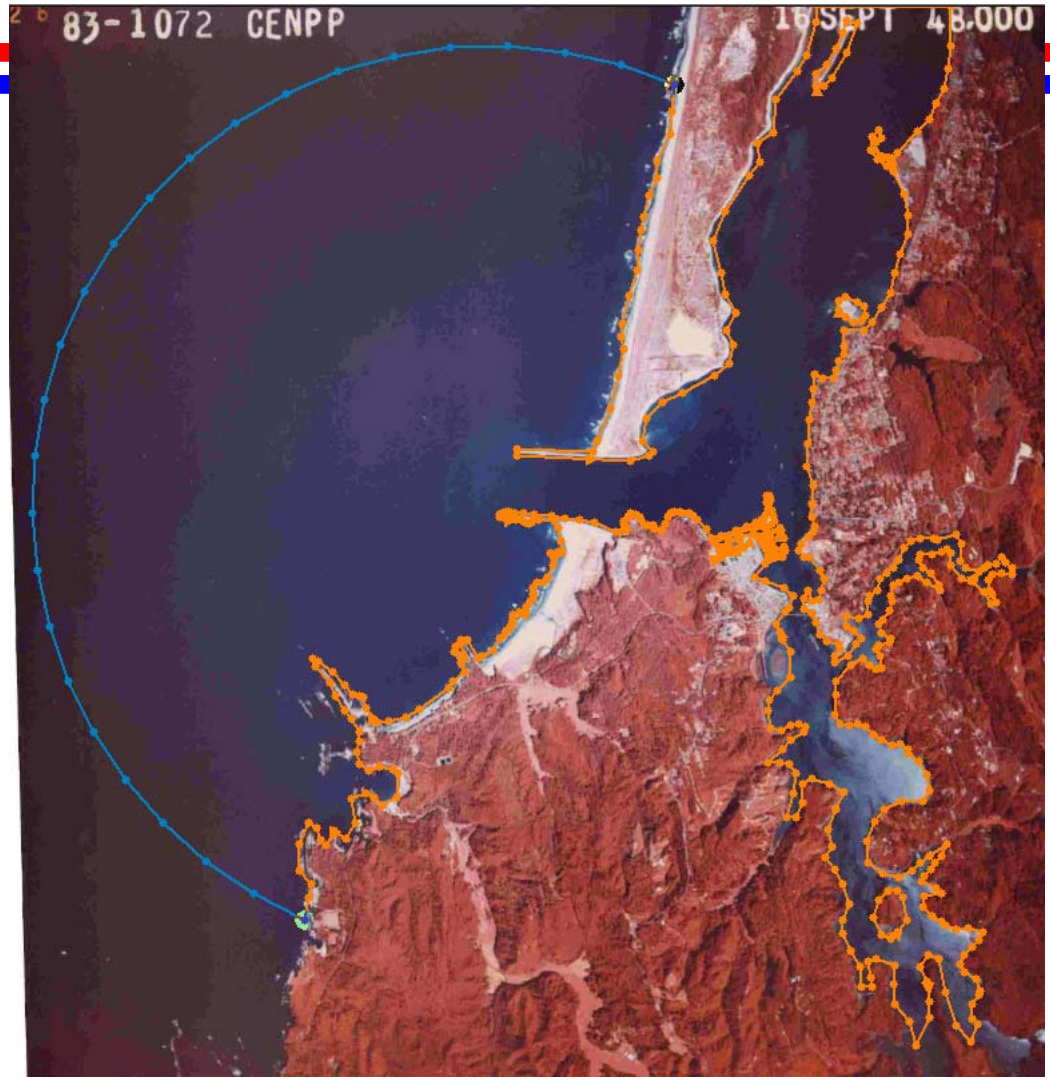


Critical Areas of Interest

- Should be in center of domainAway from model boundaries
- Includes areas of complex action
  - Inlets – tidal flows
  - Harbors – wave reflection and refraction
  - Breakwaters

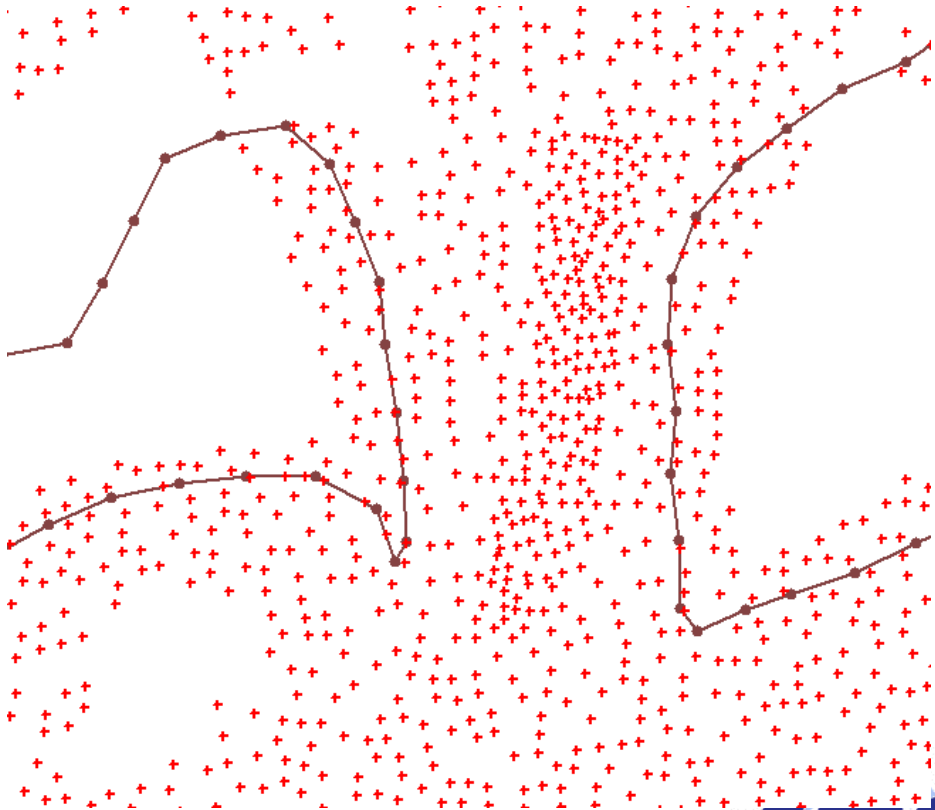


GIS Objects on Background Image



Feature Generation

- Points
  - Import from spread sheet
- Arcs
  - Read in Coastline File
  - Create arc along a contour at specified depth (0.0)
  - Convert DXF polyline
  - Convert existing grid features
- Polygons
  - Polygon file



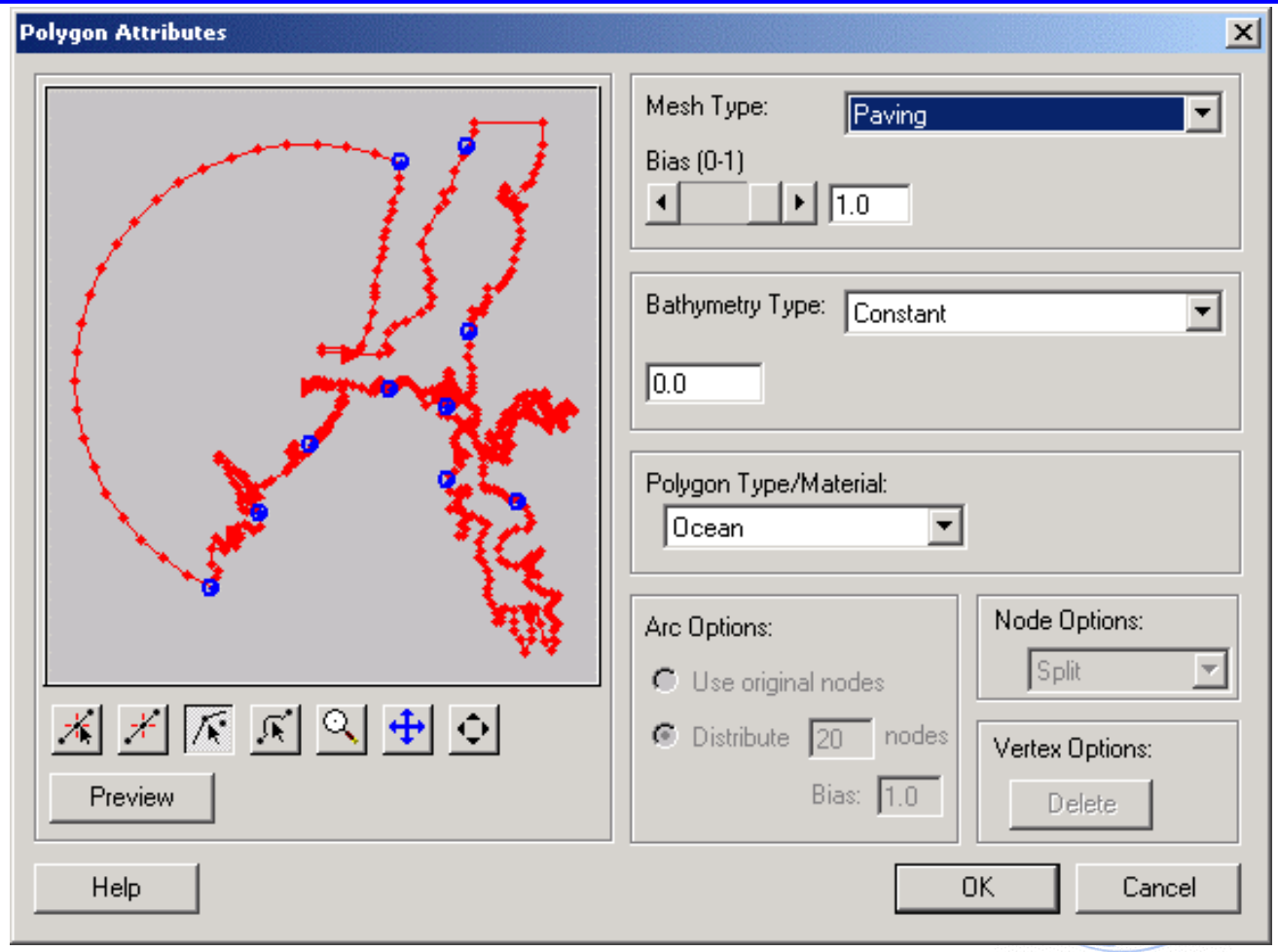
Conceptual Modeling Procedure

- Combine Site Map Data – Lesson 2
- Read in externally defined features
  - Coastlines
  - Polygons
  - Point files
- Interactively define other required features
  - Ocean boundary
  - Internal details
- Build Polygons
- Clean
- Assign Attributes

sms

Arc Attributes

- Element density based on vertex distribution
- Boundary Type
  - Ocean
  - Coastline
  - etc
- Boundary Condition (model dependent)

Polygon Attributes

- Mesh Generation Type
- Bathymetry Source
- Material Type
- Arc Distribution
- Mesh Preview